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When grassroots innovation movements encounter mainstream institutions: implications for models of inclusive innovation

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Grassroots innovation movements (GIMs) can be regarded as initiators or advocates of alternative pathways of innovation. Sometimes these movements engage with more established science, technology and innovation (STI) institutions and development agencies in pursuit of their goals. In this paper, we argue that an important aspect to encounters between GIMs and mainstream STI institutions is the negotiation of different framings of grassroots innovation and development of policy models for inclusive innovation. These encounters can result in two different modes of engagement by GIMs; what we call *insertion* and *mobilization*. We illustrate and discuss these interrelated notions of framings and modes of engagement by drawing on three case studies of GIMs: the Social Technologies Network in Brazil, and the Honey Bee Network and People's Science Movements in India. The cases highlight that inclusion in the context of GIMs is not an unproblematic, smooth endeavour, and involves diverse interpretations and framings, which shape what and who gets included or excluded. Within the context of increasing policy interest, the analysis of encounters between GIMs and STI institutions can offer important lessons for the design of models of inclusive innovation and development.

Keywords: grassroots innovation; innovation policy; social movements; inclusive innovation

1. Introduction

Grassroots innovation involves movements and networks of academics, activists and practitioners who seek to experiment with alternative forms of knowledge creation and processes for innovation. These alternatives harness local ingenuity directed towards local development. Grassroots innovation can be aimed at fostering inclusion as a process (e.g. fostering participation in the design of technology), as an outcome (e.g. providing services for marginalized groups), or even endeavour to produce structural change (e.g. enabling broad and diverse participation in the shaping and priority-setting of policies and institutions oriented to promoting science, technology and innovation, STI).

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Historical examples of grassroots innovation movements (GIMs) include, among others, the Appropriate Technology movement in the 1960s and 1970s, the Lucas Plan and movement for socially useful production in the UK, and the Alternative Technology movement (Smith 2005). Many of these activities were subsequently supported (often at an early phase) by development agencies and science and technology institutions. For instance, sections of the OECD and International Labour Organisation, as well as the World Bank, UNDP, UNEP and several Science and Technology institutions at the national level, conducted activities around 'appropriate technology' in the 1970s and 1980s. So, development agencies and mainstream Science and Technology institutions have historically shown interest in alternative models of technological change and social development originating in GIMs.

With the impact of the current global economic crisis, new political attention to issues of inequality and social inclusion has drawn institutional attention once more to GIMs and varied notions of inclusive innovation. For example, the OECD has started to develop concepts and models of intervention around 'inclusive innovation', 'inclusive growth' and 'inclusive development' (see de Mello and Dutz 2012; OECD 2012a; OECD 2012b, respectively). This activity includes recognition of grassroots innovation, as well as 'bottom of the pyramid' (Prahalad 2005) and 'frugal' innovation (Bound and Thornton 2012) models. Other examples of interest on the part of international development agencies include the World Bank (Utz and Dahlman 2007), and the United Nations Development Programme (UNDP 2010, 2013), among others. Thus, within the context of increasing interest in inclusive models of innovation, it is important to realize that though inclusion is a fashionable word at the moment, it involves a diversity of interpretations and ways of framing what gets included, and what remains excluded. Therefore, it is relevant to analyse how policies and programmes at national and international levels are engaging with ongoing, vibrant GIMs in different country contexts.

In this paper, we aim to study how GIM encounters with mainstream institutions of STI can lead to the development of new models of inclusive innovation. We analyse how different framings and interpretations of innovation, social inclusion and participation are negotiated and contested, and what modes of engagement GIMs use in order to forge alternative pathways of innovation (Hess 2007; Smith 2007). In order to do this, we focus on selected encounters experienced by specific grassroots innovation social movements: the Social Technologies Network (STN) in Brazil, the People's Science Movements (PSM) and the Honey Bee Network (HBN) in India. The approaches, experiences and encounters with mainstream STI institutions are different in each case. We consider some of the events, issues and arenas where encounters with mainstream innovation have been particularly pronounced.

Our analysis consequently uses the varied experiences in these cases to explore how policy interest in 'models' relates to the plurality of ideas, approaches and contexts of grassroots movements, which are focused on building locally sensitive alternative pathways for grassroots innovation. Further, the cases highlight that inclusion is not an unproblematic, smooth endeavour; rather, in practice it can also involve uneven, unequal, incomplete and sometimes antagonistic processes and outcomes. We argue that the analysis of encounters between GIMs and mainstream STI institutions can offer important lessons for the design of models of inclusive innovation and development around the world.

The paper is structured as follows. The following section builds on prior work on social movement framings of grassroots innovation to discuss models of grassroots or inclusive innovation, as well as two different 'modes of engagement' that shape GIM encounters with mainstream STI institutions. Section 3 presents the three GIM cases and their 'encounters' with mainstream innovation and development institutions and policies. Section 4 presents some analysis of the three cases' experiences, and related discussion. The conclusion offers some lessons for policymakers' intent on building models of inclusive innovation.

2. From framings to models: insertion and mobilization

Current interest in inclusive innovation has fostered interactions between GIMs and mainstream STI institutions. Encounters with mainstream STI institutions are often important for the survival and expansion of grassroots innovation, for example, by providing resources and/or scaling up experiences. But such encounters can also be controversial since mainstream systems of innovation and GIMs usually rely on different approaches to innovation which might generate an uneasy mix of cooperation and competition for ideas and models of innovation for development. Thus, although STI and GIM are neither clear-cut nor antagonistic positions, it is important to consider what their differences are in their approach to innovation (see Table 1 based on Ely et al. 2013).

As Letty, Shezi, and Mudhara (2012, 1) point out, it is common to associate grassroots innovation with the general aim of 'exercising control over the innovation process' as well as participation in the design of technologies, policies and regulations, thus regarding grassroots innovation as distinct from mainstream STI. However, while a strict definition casts grassroots innovation as innovation coming *from* the 'grassroots' (Gupta 2013) (meaning that it is generally a result of a bottom-up process emanating from communities and users), in practice it can also include actions *with* and *by* governments, R&D institutions and aid agencies directed to and including marginalized groups (see Cozzens and Sutz 2012).

On the other hand, mainstream systems of STI are often associated with relatively centralized, formally organized research institutions. Innovation policy aims are generally expressed as an imperative to catch-up with or keep-up with an apparently universal techno-economic frontier, typically based on information technology, biotechnology and nanotechnology (Freeman 1992;

Table 1. Mainstream STI institutions and GIMs' approaches to innovation.

Characteristics	Mainstream STI	GIMs
Political dimensions		
Predominant actors	Universities, public labs, commercial firms, ministries and other public institutions, international funding agencies	Civil society, NGOs, social movements, cooperatives
Priority values	Scientific advance, for-profit innovation/not necessarily focused on social inclusion	Social justice/not necessarily focused on for-profit innovation
Mechanisms		
Principal incentives/ drivers	Market demand and regulation/science competence	Social needs/cooperation and community empowerment
Sources of investment	State/corporate funded, venture capital	Development aid, community finance, donations, state funding
Forms of appropriability	Intellectual property framework strongly biased towards patent-based innovation	Not appropriated by individuals – seen as common goods
Knowledge dimensions		
Sites of innovation	Laboratories and R&D institutes, boardrooms and ministries, market-based firms	Community projects and participatory processes, social movements
Predominant forms of knowledge	Scientific and technical knowledge	Local, situated knowledge/ indigenous knowledge
Emblematic technological fields	Biotechnology, ICTs, nanotechnology	Organic food, small-scale renewable energies, water sanitation

Perez 1983). Furthermore, mainstream STI institutions have historically struggled to recognize 'other' modes of knowledge including indigenous knowledge and community-based knowledge and technologies, although more recently this has arguably shifted to include more decentralized modes as well as more open forms of innovation (Chesbrough, Vanhaverbeke, and West 2006; Hess 2007).

Given these different approaches, and the fact that both are dynamic and develop over time, encounters between grassroots innovations and mainstream STI institutions might imply a negotiation of different meanings and frames of inclusion in the creation of models of inclusive innovation.

Frames and models of inclusive innovation can be regarded as two different – and recursively connected – aspects of the process of building alternative pathways of innovation. According to Snow et al. (1986), framing involves a process of meaning production that allows GIMs to identify and organize their experience in forms that help them to challenge more powerful narratives. In this way, 'collective action frames are action-oriented sets of belief and meanings that inspire and legitimate the activities and campaigns of a social movement organization' (Bendford and Snow 2000, 614). In the case of GIMs, following Jamison (2001), we argue that an important aspect to their framing has been critique of existing mainstream STI and the construction of alternative pathways of innovation and social inclusion. In a recent review article, Smith, Fressoli, and Thomas (2014) identified three broad framings of inclusion and knowledge production in GIMs: *grassroots ingenuity*, emphasizing grassroots knowledge and products catering to the needs of their communities, and which are not provisioned through existing markets and state processes; *grassroots empowerment*, concerning the prospects for transforming local situations, framing innovation as empowering the grassroots to have great control over their futures; and *structural transformation*, which lays emphasis on raising awareness about structural impediments to alternative pathways of innovation, e.g. from mainstream regimes of production and industrial elites.

However, even when frames inform alternative visions, action-repertoires and pathways of innovation, they do not necessarily constitute a blueprint for mobilization and socio-technical experimentation. In order to organize and multiply social actions in a fashion that is readable by mainstream STI institutions, GIMs need to translate their framings into models, and those models in turn have to be legible and meaningful to framings associated with mainstream STI institutions.

Designing models of innovation for inclusion and development implies that there exist ways to formalize, abstract and define variables or principles; and that it is possible to establish logical processes to develop effective and inclusive innovations (and thus policies can be designed following such models).[1] Thus, this tendency of models to be built towards a single or simplified heuristic suggests a challenge for designing and negotiating models of innovation that support GIMs in identifying specific solvable problems, identifying stakeholders, proposing possible modes of participation and knowledge production, and seeking sources of funding.

Ideally, the implementation of a model can also test ideas drawn from different frames and allow processes of learning that would eventually create feedback and transform the framings as well. However, the design and implementation of models is a tricky process. For instance, models can not only be pursued as a means to an end (e.g. fostering a process of participation as part of the innovation process), but also models might come to be regarded as ends in themselves (see Sennet 2008). The latter generally occurs when a technological intervention is regarded as a universal, technological fix for social problems (Schön 1983; Weinberg 1991). This is sometimes attractive to policy-makers and practitioners, though as we shall see, such reductionism may not fit well with the diverse realities and framings of grassroots innovation.

So, behind the abstraction of models, there is usually a negotiation and compromise between different actors over resources, aims and frames of inclusion. How combinations of these different frames are translated into models of innovation, and how those models are subsequently applied, will depend on the political strength and creative capacity of GIMs to negotiate with policy-makers and mainstream institutions.

Some research has tried to characterize how encounters between GIMs and mainstream institutions can lead to the construction of alternative pathways of innovation and development (Hess 2007; Smith 2006). Following these authors, we acknowledge that encounters can be shaped by at least two modes of engagement.

First, there is *insertion* of GIM models of alternative innovation (or at least some of its elements) into wider mainstream policies of STI. The *insertion* mode of institutional engagement proposes to read grassroots creative capacities in ways that make it legible and useful for existing innovation systems and product markets. From the point of view of GIMs, insertion means fitting into prior spaces of innovation and playing by or adapting to the rules of dominant institutions, technologies, regulations, etc. The reverse side of the same movement may happen at the locus of top-down engagement, where mainstream institutions seek to insert and capture ideas, elements and even models from GIMs, adapting them to their own agendas and practices.

Either moving from grassroots up to policy, or from policy down to grassroots, encounters may generate some kind of adjustment and transformation of aims and strategies, leading in some cases to processes of negotiation and construction of models; or they may also lead to appropriation of ideas and products without necessarily being models for alternative pathways of inclusion and development (see Hess 2007; Smith 2006).

If this occurs, giving way to policy disagreements, or if mainstream STI institutions are impenetrable to GIM proposals, a second mode of engagement can arise. This happens when there is *mobilization* or resistance of grassroots to incumbent regimes, with the aim of developing pathways towards alternative innovation systems. In this way, mobilization implies direct attempts to transform the spaces of innovation by challenging the dominant practices, technologies, power relations and discourses. Though mobilization is not a model of grassroots innovation, this perspective is important since it may eventually force the incumbent regimes to change *their* models, and/or lead to autonomous experimentation with new socio-technical arrangements.

Thus, as GIMs interact with mainstream STI agendas, negotiating their models of innovation to enact change (either through engagement or opposition), they face the challenge of having their goals captured and integrated and/or realizing the need to resist and mobilize in order to transform mainstream systems of innovation and technological change. These dynamics are shaped by the interplay of many different influences, such as policy framework and policy culture, the level of community organization, forms of resistance to an imposed technological conformity and the innovators' capacity to generate interest among policy-makers.

In this context, choosing between strategies of insertion and mobilization is necessarily related with the capacities of GIMs, as well as their framings, and the conditions of incumbent STI institutions. As we discuss below in Section 3, all three cases show different strategies of insertion and mobilization in order to build pathways of inclusion; but the context and resistances they face are different, and thus outcomes are very different. In Section 4, we argue that the outcome of these encounters has implications for the construction of models for inclusive innovation.

3. Three GIMs

India and Brazil are currently the sites for notable and internationally visible attempts at developing grassroots innovation. Since the early 2000s, the Social Technologies movement in Brazil has

involved activists, public companies and communities seeking innovation agendas and arenas that develop solutions to the problems of those on the margins of economic growth, or who suffer the negative consequences of mainstream growth patterns. In India, the HBN has a 20+ year history, while the PSM offers a longer historical trajectory, originating in the 1980s and with even earlier roots. All three cases presented here indicate attempts to engage with mainstream regimes of innovation and development.

In this section, using documentary analysis from archive material, semi-structured interviews and participant observation,[2] we study how GIMs encounter mainstream STI institutions and what modes of engagement they apply. Hopefully, the analysis of these cases will provide some clues on who and what is being included in innovation models, and under what circumstances, in order that the challenges, limitations and possibilities posed for development can be debated.

3.1. *Honey Bee Network*[3]

The HBN emerged in 1989 among a group of scientists, farmers, academics and others interested in documenting and disseminating traditional knowledge and local innovation in local languages. They focused on ensuring that the individual innovators would receive benefits from their local ingenuity. This was born in part as a response to the Green Revolution of the 1960s and its associated challenges, such as further marginalization of small-scale farmers.

The HBN – an informal network that acts as an umbrella for various others – takes a very precise position on the meaning of 'grassroots innovation': as invention and innovation coming from the grassroots, often among people with little formal training and reliant on local, traditional or indigenous knowledge (HBN 2013). The network's main activity is the scouting and documentation of innovations and traditional knowledge based on different actions such as visiting communities, interviews, awards and competitions. A second step is related to the exploration of the commercial potential of products and processes identified during scouting. This involves not only supporting local grassroots innovators in the process of patenting, but also offering further assistance in terms of prototyping, incubation and seed funding in order to assure commercial viability (Sone 2012).

As just described, the HBN aims to foster creativity and recognition of the capabilities of people to develop their own solutions through their interaction with other innovators, entrepreneurs and supporting governmental institutions. Thus, we characterize its initial framing of knowledge production as a mixture between grassroots ingenuity and grassroots empowerment.

With regard to the engagement of the HBN with mainstream institutions, in its early stages this was intentionally limited, as to a large extent a 'no external funding' principle was adopted over the periods of establishment of the Network in the late 1980s, and its related organizations, SRISTI (established in 1993) and GIAN (established in 1997).[4] Relying on material and non-material contributions from innovators and volunteers, the networks built a strong, values-led mobilized group of members that ensured their sustainability through the 1990s. One of the key mobilization elements are the *shodhyatras* – journeys on foot for up to 15 days to explore the grassroots innovation in villages in different parts of India. This and similar activities have allowed the HBN to connect formal institutions with traditional knowledge holders, making it possible to map around 100,000 ideas, forms of traditional knowledge and innovations.

The sheer amount of ideas surveyed does not allow support for every project or innovation. But almost 200 innovations were given awards by the National Innovation Foundation (NIF), an autonomous institution of the Department of Science and Technology (DST), between 2001 and 2005. In addition, NIF and GIAN have filled patents for 405 innovations. One emblematic success story of the NIF model is the Mitticool fridge, constructed out of clay and working without

electricity on the principle of evaporative cooling. After a number of years of experimental activity related to his traditional clay crafts, the inventor – Mansukhbhai Prajapati from Gujarat – benefitted from GIAN's support in product development until he launched the Mitticool fridge in 2005. He was awarded a National Award in its Fifth National Competition for Grassroots Innovations and Traditional Knowledge in 2009. The invention was granted Indian patent No. 240633 and is currently on sale (NIF 2013).

The mode of engagement of the HBN could be described as mainly based on a strategy of mobilization and cautious insertion. As the HBN and associated institutions gained in reputation over the years, encounters with mainstream STI policies have increased. The HBN benefited from the fact that several governmental and non-government bodies were already engaged with similar initiatives of innovation activity based on traditional knowledge in India. Initial support for the work of the HBN from mainstream policy came when the NIF was established in 2000 to strengthen grassroots technological innovations and outstanding traditional knowledge, with Dr R A Mashelkar, former Director General of the Council of Scientific and Industrial Research (CSIR) as its chair. In 1999, the Indian Finance Minister had announced the need to set up a Micro Venture Innovation Fund for helping small innovators and traditional knowledge holders, and in October 2003 the fund was established, with a corpus of Rs. 5 crore (approximately US$1.1 million) (NIF 2004). There have been subsequent changes in the NIF's funding regime, described here only in part. In February 2007, it was announced that NIF would be given the status of an autonomous institution under the DST, with an annual budget of Rs. 8–10 crore per year (approximately US$1.8–2.2 million) (NIF 2007). NIF has also had Memoranda of Understanding with CSIR and Indian Council of Medical Research (ICMR) under which support has been provided to add value to local knowledge (NIF 2010). In June 2010, the pattern of funding was changed from the 'corpus fund' to a regular annual budget. NIF was converted to a grant-in-aid institution under the DST, with a total project outlay of approximately US$5.6 million during the Eleventh Five Year Plan (2007–2012) (NIF 2011).

Thus, based on their previous mobilization, the insertion approach has been successful in facilitating further expansion of the HBN networks – already very broad prior to the initiation of the NIF. They have since spread yet wider to link NIF's work to state-level and national-level governments, banks, firms, research laboratories and civil society organizations. These and the huge networks of volunteers across the country perform the bulk of the work, supported by the staff of around 40.

The NIF was founded in the HBN philosophy, but retains a degree of separation as an autonomous institution within the Indian government's DST, working to scout, document and develop commercial innovations in rural areas of India in order to benefit the masses in India and elsewhere (with a proposal for a global network drawing on the Honey Bee philosophy) (Gupta 2012). This cautious strategy of insertion was only possible due to the political capital generated over many years of the movement's development. Thus, by mobilizing supporters and collaborators widely, HBN retained influence over insertion into policy models.

3.2. *Social Technologies Network*

Originating in Brazil in the early 2000s and suspended in 2012, the STN involved a range of participants, from academics to activists, unions, government representatives, funding agencies and, especially, non-governmental organizations (NGOs) and community groups. Most of these institutions, including several national ministries such as the Ministry of Science and Technology and semi-public companies such as Petrobras, can be considered mainstream STI institutions. So, from early on, the STN was in fact a mixture of grassroots and mainstream STI.

The STN had as its main aim fostering a more democratic process of innovation for development by turning isolated initiatives into broader public policies and application (Miranda, Lopez, and Couto Soares 2011). Those involved with the STN conceived innovation as a tool or catalyst for local development with particular emphasis on empowerment as part of the goal of the interaction between communities and technology developers (Fressoli, Smith, and Thomas 2011). A key goal for the Brazilian STN was building a more socially just relationship between technologists and local communities. To meet this goal, the community must have control over both the process of innovation and the distribution of outcomes. Local groups might not directly be the innovators, but developers make sure that they are fully included in adopting and benefiting from the technology. In other cases, the technology was deliberately developed by local groups, selected by the STN and then scaled up (or reapplied) in engagements between developers and the community in manufacture, maintenance and operation. Thus, the question of empowerment (more than ingenuity) was from the beginning the key frame for inclusion by the STN. Although, in the long term, some actors of the network also saw participation in a local ingenuity frame in developing knowledge solutions as a possible pathway to further social transformation (see Smith, Fressoli, and Thomas 2014).

From 2001, the Banco do Brasil Foundation organized an annual award for Social Technology initiatives (which serves as an invitation to a certification process). An associated database includes hundreds of examples of grassroots innovation, mainly in the areas of agro-ecological production, water recollection and sanitation, education and renewable energy. But only a few of these examples have been selected for reapplication and scaling up, in this way being granted access to funding and support from mainstream STI institutions.

An illustrative example of an encounter between the STN and the state is the One Million Cisterns Programme (P1MC).[5] P1MC, as it became widely known, aimed to build a massive number of water cisterns in a large semi-arid region in Northeast Brazil with a population of around 25 million. The region is characterized by low rainfall and scarce groundwater sources. The family-scale cisterns captured and stored seasonal rainfall sufficient for personal and productive needs (e.g. agriculture) through the drought season.

The cistern programme was originally devised by the Semi-Arid Association, a network of more than 700 institutions, social movements, NGOs and farmers' groups, which later became an important actor of the STN. The Brazilian Ministry of Environment was also initially involved, although the programme was later embraced by the Ministry of Social Development. The Semi-Arid Association itself has its origins in the popular mobilization against dominant paternalistic schemes of aid in the region, known as the 'industry of drought' (*indústria da seca*). Instead of relying on water supplied by water tanks provided by local political patrons, the Semi-Arid Association proposed to build simple cement-layered containers that collect rainwater from the roof, with a capacity of around 16,000 litres, enough to sustain a family's needs through the region's drought season.

With the arrival of the centre-left government of Lula da Silva in 2003, the Semi-Arid Association found space to insert this programme into national development policies to be funded by the Ministry of Social Development. Later, in 2005, the Cistern Programme also became part of the reapplied technologies of the STN. Since its start in 2003, over 549,000 water cisterns were built and put in place by local inhabitants with the support of the STN and the Ministry of Social Development (MSD 2013). The main feature of the technology is that it is built by its 'users' (farmers/masons, a common archetype of Brazilian semi-arid areas). The self-building aspect of the cisterns is intended to foster relationship-building in the community, through the process of learning to build, use and modify the technology, indicating a grassroots empowerment framing. The water system empowers local people in the building process while also providing autonomy from local governments and water suppliers.

However, the insertion of this model into a government programme became problematic in 2011, when the Brazilian government announced a plan to speed up the implementation of the programme through the purchase of 300,000 plastic water cisterns at almost twice the price of the original cement scheme. Focused on outcomes, this policy change disregarded the process of participation and empowerment that was central to the design of the programme. Also, some private companies saw a business opportunity in the proposal (Dias 2012). Furthermore, early attempts to introduce the plastic cisterns showed design problems, as the plastic cisterns bent and folded due to the intense heat of the region.

The modification of the model by a part of the government (in particular, the Ministry of Integration) provoked a campaign of actions against the plastic cistern initiative, including public meetings and a public rally of 10,000 farmers in the city of Petrolina, in Pernambuco (see Carta Maior, December 20, 2011). Protestors claimed that changes in management excluded and disempowered people. Another element of the controversy included concern that introduction of the plastic cisterns would enable the local political elites to regain power over controlling water, by controlling the distribution and marketing of water cisterns. By the time this attempt of modification of the model had occurred, however, the seed of empowerment had already been planted: banners that waved at the rally contained phrases such as 'We do not want water at any price. We want to participate'. While the government's approach was built around the plastic cistern artefact and the accomplishment of policy goals, the users' approach was mostly concerned with the process and the inclusive dynamics it generated. The capture of the model by the Ministry of Integration led to a controversy about the different technologies that was ultimately a clash of frames about social inclusion.[6]

For almost a decade, the insertion of the model was very successful in building more than 500,000 cisterns and empowering the population of the semi-arid region. However, as a part of the government attempted to strip the programme of its empowerment element and focus instead on inclusion as an outcome, the mobilizations by the movement pushed the Ministry of Social Development to reinstate the self-build cistern programme, though the Ministry of Integration also continued to install some plastic cisterns (Semi-Arid Association 2013). The cistern example shows how the Semi-Arid Association and the STN managed to draw power from mobilization first, to insert their model into the national public policy agenda, and then to resist its capture and modification. Overall, the case shows how the translation of framings of inclusion into models of innovation is not a straightforward process, and how an exclusively instrumental approach to models can oversimplify inclusion against the more complex framings proposed by GIMs.

3.3. *People's Science Movements*

The PSM began in India in the early 1980s, encompassing a range of grassroots networks, organizations and associations, each of which varied in size, history, focus and strategy. The roots of some organizations and networks can be traced back decades earlier. All shared a concern for leveraging a better relationship between science and social needs (Varma 2001). Some of these groups focused on promoting and popularizing science, including through local language education initiatives, to 'reduce disparities in scientific knowledge', while others were more concerned with 'promoting an alternative development model, based on local Indian science and technology' (Varma 2001, 4796).

The PSM grassroots innovation approach came out of discussions in the late 1970s between individuals in national S&T institutions[7] and PSM organizations. These discussions centred on the potential for upgrading traditional techniques through the application of 'modern' science, with particular attention to the achievements and limitations of existing appropriate technology

programmes. The PSM approach subsequently differed from prior approaches applied at the CSIR. The latter focused on downsizing modern techniques to make them appropriate for tiny/micro/small and medium enterprises typical in rural India. The PSM model also differed from the *grassroots ingenuity* approach used at the Khadi and Village Industries Commission, which focused on the upsizing of traditional techniques to modernize the *individual* producer for competition, for example, in the market sectors of leather tanning and product making (Abrol 2012, 2013a).

Instead of focusing on technology development per se, the PSM grassroots innovation approach sought to enable artisans, workers and peasants to function as interlinked *social carriers* of technologiesto organize themselves cooperatively and acquire capabilities for industrial and technological upgrading of local production as 'systems in themselves'. An important feature of the model has been the *open participation of the potential social carriers* in the assessment of technology implementation needs. The PSM grassroots innovation approach has thus included aspects of participatory development of technologies, enhancement of 'user capability' and application of heuristics of 'pro-poor' business models (Abrol 2013a). Further, the PSM approach is embedded in a systemic understanding of the local rural and peri-urban economies, recognizing that (a) all these occupations are interlinked and should be suitably upgraded as a system in order to enhance their collective competitiveness, and (b) when upgraded they should be able to serve the local rural markets and also meet needs of the urban poor not yet addressed by the modern industrial sector (Abrol 2013a).

While being focused on the systems-wide upgrading of traditional knowledge and techniques, the PSM grassroots innovation approach has sought to involve the institutions of mainstream STI in the improvement and commercialization of traditional techniques, and the harnessing of technical improvements in the systems of local production, by building on grassroots ingenuity (indicating an empowering framing). However, like the STN, the PSMs exhibited a dual focus; both on enabling concrete outcomes for marginalized people in India, but also consciousness about the structural barriers to deeper change. The PSMs consequently judge progress jointly to include building capabilities for technology development and implementation *as well as* towards the larger purpose of structural change (Abrol 2013a). In this sense, the PSMs are part of a wider democratic movement motivated by a larger framing of 'structural transformation'.

An emblematic success of the PSMs was around the development of successful group enterprises and broader sectors in cleaner vegetable-based techniques for leather processes. This initiative involved people in tanning, carcass processing and flaying, and more. The vegetable-based tanning technology itself was originally developed in the 1950s by the Central Leather Research Institute, but remained filed on a shelf, unimplemented in practice. The PSMs drew on their knowledge of local economies, framed as area-based production networks, and instead of focusing on the technology artefact, developed a systemic approach, forging an unprecedented collaboration between tanners and flayers (including transcending divisions of caste), developing cooperative enterprises and improving local supplier relationships (Abrol 2013a).

In terms of engagement with mainstream institutions, the PSM in India has based its strategy on both mobilization and cooperation with other social movements in order to better influence and transform mainstream schemes. It thereby achieved the insertion of its own model into S&T institutions. Thus, from an early collaboration with the DST, the PSM was able to insert its model to include schemes across India such as the S&T Application for Weaker Sections, S&T Application for Rural Development, Tribal Sub-Plan, Special Component Plan for Scheduled Castes and S&T for Women and Young Scientists Programme. All these schemes draw on the various characteristics of the PSM approach: a multi-sectoral approach focused on local markets, capabilities and resources; equitable linkages with S&T institutions; and participation of beneficiary groups in all stages of the innovation process.

Furthermore, from their original interventions in the rural non-farm sector, in the mid-1990s, the PSM initiatives have also become active in the farm sector and more recently PSM initiatives have been extended to the implementation of agro-ecological approaches in rural development.

Nevertheless, even after three decades of successful insertion into mainstream STI institutions, the PSM still faces the challenge of how to translate its framing of empowering and structural transformation into readable models.

For instance, the enormous diversity of perspectives, approaches, capabilities, areas of strength, technologies developed for rural areas, and even methods of utilizing DST's support grants, has been a strength as well as a limitation. While the DST suggests that the PSM approach to grassroots innovation should be treated as a general purpose model for funding rural innovation by government agencies in India (DST 2008), there is debate within the PSM about how to retain the original PSM aims towards structural transformation, and how to absorb and nourish the area-specific processes needed for implementing rural innovation across diverse situations (Abrol 2013a).

As a result, new strategies are being experimented to deal with this challenge; for example, the need to link the work on rural non-farm sectors with the implementation of agro-ecological approaches to deal with the challenge of sustainable diffusion of the upgraded systems of local economy in the face of increasing international competition.

4. Discussion

As interest in models of innovation and social inclusion grows among aid agencies and STI institutions, encounters between GIMs and mainstream STI institutions are coming to the fore. However, as we have seen, there are different ways to first, frame both the purposes and forms of inclusion, and second, translate them into models of innovation, with consequences for which elements of an innovation activity become incorporated into models and which get excluded. In this section, based on our analysis of the three cases, we want to highlight three aspects of STI–GIM encounters that may help advance understandings about the contributions and possible limitations of GIMs towards the construction of alternative models of innovation.

The first characteristic is that GIMs should be regarded as active agents open to interaction with mainstream STI agendas, and able to negotiate with mainstream institutions to enact change (either through engagement or opposition). Furthermore, in the encounters, all three GIM networks have used strategies of insertion and mobilization dynamically according to the level of openness and risks of capture that mainstream STI institutions have shown. In the case of HBN, for example, mobilization carefully cultivated legitimacy and cemented grassroots values in order that they might be retained in subsequent insertion into policy support. In the case of STN, as the Cistern model was inserted into a revised policy programme which translated inclusion as an outcome, it prompted mobilization in order to reassert an empowerment framing. Finally, the PSM negotiated a complex combination of popular mobilization and policy insertion from the outset, and while a more rounded model for rural development resulted, the depth of its implementation (or not) remains controversial.

The capacity of GIMs to switch from mobilization to insertion and vice versa, or even combinations, may be regarded not only as a response to the context, but also as a deliberate attempt to retain autonomy. This ability shows that models are not exclusive to mainstream STI institutions, and thus, that social movements are also agents with certain types of power and capacity to make instrumental use of models, as tools to shield their activities and nurture mobilization and alternative ways of knowledge production (Smith and Raven 2012).

The second characteristic is that GIMs have a capacity for reflexive learning, building on lessons gained from previous approaches. Thus, framings seem to arise from a critique on

previous initiatives and visions of innovation for inclusion and development (e.g. as a response to appropriate technologies in the case of STN, as a reaction to ignorance about indigenous knowledge in the case of HBN, or to technology-centred approaches in the PSM). By reflecting on the shortcomings of previous approaches and building their unique framings, GIMs can provide powerful alternative pathways of innovation, social inclusion and development to those of incumbent STI institutions.

However, while recognizing this ability of GIMs, it is also important to acknowledge that there are some differences in the ways GIMs have framed grassroots innovation and, by implication, how they approach issues of inclusion. Therefore, although the three cases show some elements of ingenuity, empowerment and structural transformation, they place significant differences in their emphasis. In this way, the HBN emphasizes grassroots ingenuity by putting forward a model for identifying and helping (individual) innovators to pilot and commercialize their innovation. Meanwhile, the STN hinged on a mixture of empowerment and ingenuity with a model based upon development activists co-producing specific innovation objects with local communities who participated fully in the process and outcomes (though STN also developed elements of structural transformation in their framing). Finally, from the beginning, the PSM initiatives have emphasized structural transformation in combination with ideas of empowerment and ingenuity. In this way, PSM seems to have arrived at a more systemic model in which innovations form part of activities for more inclusive economic organization and co-operation in regional clusters. Although more research is needed on the analysis of these differences, it is interesting to note that while ingenuity and empowerment are widely promoted by GIMs and fairly accepted by mainstream STI, the more far-reaching frame of structural transformation proposed by the PSM and the STN still faces difficulties in its translation into models.

The extension of the critique of incumbent models of innovation and the limits of their contribution in attempting to incorporate GIMs is the third characteristic that we want to highlight. Even as grassroots, innovation initiatives are of interest to policy-makers as a means to reach below the radar and bring communities into view, this does not necessarily mean that they will alter broader innovation agendas, institutions and practices. Since mainstream STI can be constrained by its own trajectories and approaches, building new models of innovation and development can be a challenge in terms of resources, extent, aims or space for experimentation, all of which can result in difficult dilemmas for GIMs (Smith, Fressoli, and Thomas 2014). More inclusive models may empower a wider variety of participants to undertake innovation within a particular field, such as energy, but this is not necessarily the same as them having the power to shape the priority agendas for innovation in that field (something influenced by the political economy of STI, and requiring changes in those political and economic relations).

In addition, whereas grassroots initiatives seek context-sensitive solutions, policy pressures to scale up lead to de-contextualized models whose abstractions risk losing sight of the generative situations and alienate those who were involved (such as inattention to local power relations, in the case of the Cistern programme, and the fear by communities of goals being subsumed by political patronage). Indeed, decisions about how to represent groups for inclusion in alternative models, and which representations to include – decisions taken by those with more powerful influence over innovation processes – can effectively disempower and exclude some grassroots perspectives. Inevitably, not everything can be included in the participatory design, prototyping and innovation development; something will be overlooked or communicated poorly in the process, to return disruptively in, say, mobilizations against the exclusions of implementation and commercialization (Asaro 2000). Thus, even when GIMs have a strong mobilized base and good insertion in the STI agenda, the sheer diversity of grassroots experimentation in terms of initiatives, technologies and demands, and the complexity of their framings – which may include elements of empowerment combined with claims for structural

transformation – will probably overwhelm the capacity or the willingness of mainstream institutions to accommodate alternative pathways of innovation.

Ultimately, these three aspects of GIM–STI encounters point to a more complex challenge for the construction of models of innovation and social inclusion. This is the challenge of diversity in terms of problems and solutions, claims of empowerment and the heterogeneous layers of demands that GIMs can pose to mainstream STI. In the face of this complexity, it can be very tempting to policy-makers, mainstream STI institutions and even to practitioners in grassroots groups to reduce the diversity of grassroots experimentation to an abstract model that may be measured by simple outcomes. However, a fixed heuristic will overlook the broader framings of GIMs. Regarding models as an end in itself puts pressure on the success or failure of the implementation process, undermining any learning process that might develop. Furthermore, devising models of innovation and social inclusion, as an end in itself, might help to solve emergency situations or provide basic services but hardly will attend to ideas and ways of cultivating deeper forms of grassroots innovation. This seems to be the case regarding the reframing of the model (and of its main goal from empowerment to inclusion as an outcome) suffered by the Semi-Arid Association and the former STN in Brazil. But, as the longer history of the Indian cases shows, not every strategy of insertion is bound to be captured by mainstream STI.

So, if instead of regarding a model as a silver bullet solution, modelling and reflection becomes an element among other strategies of engagement and pathway construction, then more plural means to broader goals and visions of social development and structural transformation could be retained. Seen as part of a pathway, models can be re-conceived as part of processes that constitute spaces of experimentation for different approaches, networks and socio-technical arrangements. But, this perspective requires stakeholders and policy-makers to become appreciative of the complexity of framings, and the difficulties and resistances that they face in the translation into models. The latter option might call for policies to be put into context, and to be honest about the wider power and framings of relations that shape their operation.

5. Conclusions

Models are a necessary step in building pathways to alternative knowledge production and sustainable development. But they are also subject to tensions between different framings of inclusion (i.e. outcomes vs. process) from networks/movements, politicians, funding agencies and stakeholders. The three case study encounters described earlier show a combination of framings (ingenuity/empowerment/transformation) and modes of engagement (insertion/mobilization). We discussed the challenges of retaining control over framings and how they materialize in support for innovation, the risks of capture, and the complexities of representation.

The renewed concern with models of inclusive innovation seems to be a propitious moment for GIMs to propose models and ideas in order to get funding and support. However, negotiations between different framings and practices are not always easy and encounters with mainstream institutions can lead to tensions, controversies or may vary over time. GIMs are active agents in the development of framings and models of innovation for development that can pragmatically use different strategies of engagement in order to negotiate their design and implementation. But at the same time, we acknowledge that strategies vary and take a long time to develop, and movements constantly face setbacks and tensions between their frames and the need to negotiate models. Thus, we argue that it is important to regard models not as a definitive solution to inclusive innovation or as simple instrumental tools for development, but as devices for opening spaces and processes of experimentation, empowerment and alternative ways of knowledge production. This perspective requires stakeholders and policy-makers to become aware of difficulties and resistance that models of inclusive innovation face. Furthermore, this approach requires that

processes are provided for reflecting on the operations of the model in practice, and for voicing dissent and revealing power relations, so that the model reveals different framings rather than excluding some. In summary, talk of models needs to avoid discussing them as arrangements for best practice or devices for scaling-up.

Based on the analysis of the cases of the HBN, STN and PSM, this paper suggests that it is important to be attentive to process-based approaches and not only outcome-based models. Thus, it is better to talk about plural spaces for grassroots encounters and engagements in innovation; spaces that are decentred, and provide context-rich experiments in practising technological democracy, as much as they are testing grounds for novel goods and services. While ongoing research will involve deeper exploration of these three empirical cases, our analysis thus far suggests that cultivating spaces for engagement and empowerment is an important policy goal, where the constantly contested and emergent forms of inclusion/exclusion can be explored and new forms of innovation practice can be developed in parallel across different sites and at different scales.

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Notes

1. Models sometimes emerge to fit what is more easily measureable, i.e. existing statistical data, such as R&D data, while the task of developing models that reflect and respond to more complex realities may be in tension with efforts towards standardization (Arond and Bell 2010; Letty, Shezi, and Mudhara 2012).
2. More information about the methods used in the project can be found at http://steps-centre.org/methods/pathways-methods/cases/historical-contexts/
3. This section draws on a draft paper by Abrol (2013b).
4. SRISTI is the Society for Research and Initiatives for Sustainable Technology and Institutions; the GIAN is the Grassroots Innovations Augmentation Network.
5. The cistern is a simple-layered cement rain water collector designed to be built by the local community.
6. For a description of the different positions in the controversy, see Portal Eco-Debate (2013).
7. These discussions involved Dr Upendra Trivedi of India's DST and Prof. P. N. Chowdury, head of the Centre for Management and Development in the Council of Scientific and Industrial Research. Dr Trivedi was also involved with the National Committee on Science and Technology for the formulation of India's first S&T plan.

References

Abrol, Dinesh. 2012. "Innovations at Grassroots in India: A Historical and Comparative Perspective." Paper presented at STEPS Centre, University of Sussex, Brighton, UK, May 24.

Abrol, Dinesh. 2013a. "Policy Makers and PSMs in the Making of Grassroots Innovation Movements: Indian Experience." Unpublished draft paper. Jawaharlal Nehru University.

Abrol, Dinesh. 2013b. "'Grassroots Innovation' Model, Honey Bee Network and Policy Making." Unpublished draft paper. Jawaharlal Nehru University.

Arond, Elisa, and Martin Bell. 2010. "Trends in the Global Distribution of R&D Since the 1970s: Data, their Interpretation and Limitations." STEPS Working Paper 39, Brighton: STEPS Centre.

Asaro, Peter. 2000. "Transforming Society by Transforming Technology: The Science and Politics of Participatory Design." *Accounting, Management and Information Technologies* 10 (4): 257–290.

Bendford, Robert D., and David A. Snow. 2000. "Framing Process and Social Movements. An Overview and Assessment." *Annual Review of Sociology* 26: 611–639.

Bound, K., and I. Thornton. 2012. "Our Frugal Future: Lessons from India's Innovation System." London, National Endowment for Science, Technology and the Arts. Accessed November 10, 2013. http://www.nesta.org.uk/publications/our-frugal-future-lessons-india%C2%92s-innovation-system

Chesbrough, H., W. Vanhaverbeke, and J. West, eds. 2006. *Open Innovation: Researching a New Paradigm*. Oxford: Oxford Press University.

Cozzens, Susan, and Judith Sutz. 2012. *Innovation in Informal Settings: A Research Agenda*. Ottawa: IDRC.

Dias, Rafael. 2012. "Uma Análise Sociotécnica do Programa Um Milhão de Cisternas (P1MC)." Paper presented at the IX ESOCITE – Latin American Congress of Social Studies of Science and Technology, Mexico City, June 8.

DST (Department of Science and Technology, Government of India). 2008. "Science, Technology and Innovation Policy 2013." http://www.dst.gov.in/sti-policy-eng.pdf

Ely, Adrian, Adrian Smith, Melissa Leach, Ian Scoones, and Andy Stirling. 2013. "Innovation Politics Post Rio+20: Hybrid Pathways to Sustainability?" *Environment and Planning C: Government and Policy* 31 (6): 1063–1081.

Freeman, Chris. 1992. *The Economics of Hope*. London: Pinter.

Fressoli, Mariano, Adrian Smith, and Hernán Thomas. 2011. "From Appropriate to Social Technologies: Some Enduring Dilemmas in Grassroots Innovation Movements for Socially Just Futures". Paper presented at Globelics2011, Buenos Aires, November 15–17.

Gupta, Anil K. 2012. "Innovation, Investment, Enterprise: Generating Sustainable Livelihood at Grassroots through Honey Bee Philosophy." IIMA Working Paper No. 2012-06-04, June 2012.

Gupta, Anil K. 2013. "Tapping the Entrepreneurial Potential of Grassroots Innovation." *Stanford Social Innovation Review*, Special Supplement on Innovation for a Complex World, Summer 2013, pp. 18–20.

HBN (Honey Bee Network) website. 2013. Accessed December 5, 2013. www.sristi.org/hbnew.

Hess, David. 2007. *Alternative Pathways in Science and Industry. Activism, Innovation and the Environment in an Era of Globalization*. Cambridge, MA: MIT Press.

Jamison, Andrew. 2001. *The Making of Green Knowledge: Environmental Politics and Cultural Transformation*. Cambridge: Cambridge University Press.

Letty, B., Z. Shezi, and M. Mudhara. 2012. "An Exploration of Agricultural Grassroots Innovation in South Africa and Implications for Innovation Indicator Development." UNU-MERIT Working Paper 23.

de Mello, L., and M. A. Dutz, eds. 2012. *Promoting Inclusive Growth: Challenges and Policies*. OECD Publishing. http://dx.doi.org/10.1787/9789264168305-en

Miranda, Isabelle, Michelle Lopez, and María Clara CoutoSoares. 2011. "Social Technology Network: Paths for Sustainability." *Innovation and Development* 1 (1): 151–152.

MSD website (Ministry of Social Development). 2013. Accessed April 16, 2013. http://www.mds.gov.br/segurancaalimentar/acessoaagua/cisternas.

NIF website (National Innovation Foundation). 2004. Annual Report 2003–4. Accessed January 25, 2014. http://www.nif.org.in/dwn_files/annual_report/AR0304.pdf.

NIF website (National Innovation Foundation). 2007. Annual Report 2006–7. Accessed January 25, 2014. http://www.nif.org.in/dwn_files/annual_report/Annual-report-2006-07.pdf.

NIF website (National Innovation Foundation). 2010. Annual Report 2009–2010. Accessed January 15, 2014. http://www.nif.org.in/dwn_files/NIF%20ANNUAL%20REPORT%202009-2010.pdf.

NIF website (National Innovation Foundation). 2011. Annual Report 2010–2011. Accessed January 25, 2014. http://www.nif.org.in/dwn_files/NIF%20ANNUAL%20REPORT%202010-11%20English.pdf.

NIF website (National Innovation Foundation). 2013. Accessed December 20, 2013. http://www.nif.org.in/bd/product-detail/mitticool-refrigerator.

OECD (Organisation for Economic Cooperation and Development). 2012a. Innovation for Development: A Discussion of the Issues and an Overview of the Work of the OECD Directorate for Science, Technology and Industry. Paris: Organisation for Economic Cooperation and Development.

OECD (Organisation for Economic Cooperation and Development). 2012b. Innovation and Inclusive Development: Conference Discussion Report, Cape Town, South Africa, 21 November 2012. Paris: Organisation for Economic Cooperation and Development.

Perez, Carlota C. 1983. "Structural Change and Assimilation of New Technologies in the Economic and Social Systems." *Futures* 15 (4): 357–375.

Portal Eco-Debate. 2013. "No Semiárido, Cisternas de Cimento ou Cisternas de Plástico Dividem Opiniões." Accessed December 20. www.ecodebate.com.br.

Prahalad, C. K. 2005. *The Fortune at the Bottom of the Pyramid: Eradicating Poverty through Profits*. Upper Saddle River, NJ: Wharton School Publishing.

Schön, Donald A. 1983. *The Reflective Practitioner. How Professionals Think in Action*. New York: Basic Books.
Semi-Arid Association website. 2013. Accessed June 6, 2013. http://www.asabrasil.org.br/.
Sennet, Richard. 2008. *The Craftsman*. London: Penguin Books.
Smith, A. 2005. "The Alternative Technology Movement: An Analysis of its Framing and Negotiation of Technology Development." *Human Ecology Review Special Issue on Nature Science and Social Movements* 12 (2): 106–119.
Smith, Adrian. 2006. "Green Niches in Sustainable Development: The Case of Organic Food in the United Kingdom." *Environment and Planning C: Government and Policy* 24 (3): 439–458.
Smith, Adrian. 2007. "Translating Sustainabilities between Green Niches and Socio-Technical Regimes." *Technology Analysis & Strategic Management* 19 (4): 427–450.
Smith, Adrian, Mariano Fressoli, and Hernan Thomas. 2014. "Grassroots Innovation Movements: Challenges and Contributions." *Journal of Cleaner Production* 63: 114–124.
Smith, Adrian, and Rob Raven. 2012. "What is Protective Space? Reconsidering Niches in Transitions to Sustainability." *Research Policy* 41 (6): 1025–1036.
Snow, David A., E. Burke Rochford Jr., Steven K. Worden, and Robert D. Bendford. 1986. "Frame Aligment Process, Micromobilization, and Movement Participation." *American Sociological Review* 51 (4): 464–481.
Sone, Lina. 2012. "Innovative Initiatives Supporting Inclusive Innovation in India: Social Business Incubation and Micro Venture Capital." *Technological Forecasting & Social Change* 79 (4): 638–647.
UNDP (United Nations Development Programme). 2010. *Brokering Inclusive Business Models*. New York United Nations Development Programme Private Sector Division.
UNDP (United Nations Development Programme). 2013. Growing Inclusive Markets database. Accessed April 13, 2013. http://cases.growinginclusivemarkets.org/.
Utz, A., and C. Dahlman. 2007. "Promoting Inclusive Innovation in India." In *Unleashing India's Innovation: Towards Sustainable and Inclusive Growth*, edited by A. Utz, 105–128. Washington, DC: World Bank.
Varma, R. 2001. "People's Science Movements and Science Wars?" *Economic and Political Weekly* 36 (52): 4796–4802.
Weinberg, Alvin. 1991. "Can Technology Replace Social Engineering." In *Controlling Technology. Contemporary Issues*, edited by E. B. Thompson, 131–141. Buffalo: Prometheus Books.